

evacuate the birds. This is to avoid having them dive into the water after the first detonation.

- In the unlikely event that the hazard zone is still not clear of protected species within one hour of sundown, the detonations shall be postponed until the next day, in which case all of the above measures shall be repeated.

4.9 Monitoring during Detonations

- The detonations shall take place in daylight hours only to allow adequate monitoring.
- No detonations shall take place later than one hour before sunset to allow adequate time for post-detonation monitoring and fish recovery.
- The aircraft shall continue to circle the project site during the detonations. Shipboard and land-based personnel shall remain in personnel safety zones imposed by the demolition contractor until the all-clear signal has been given.

4.10 Monitoring after Detonations

- The surveys shall continue for half an hour after the detonations to ensure that no protected wildlife escaped detection and was inadvertently injured.
- In the unlikely event that an injury occurs, the animal shall be captured and taken to the nearest qualified wildlife care center. Marine mammals and sea turtles shall go to the Santa Barbara Marine Mammal Center. Birds shall go to the Santa Barbara Wildlife Care Center.
- Also, in the unlikely event that an injury or mortality occurs, the appropriate regulatory agencies shall be notified immediately.
- Any fish found floating or on the beach after the detonations or pile driving shall be promptly recovered, identified as to species, counted, and measured. Such fish shall be donated to charity or to a scientific institution.
- A summary of fish mortalities shall be sent to appropriate agencies on the first working day following the detonations. Verbal reports from the field will be accepted provided that these are followed by written documentation in the final report.

4.11 Monitoring Pile Driving Operations

- The same monitoring methods and hazard zone described in the previous sections regarding monitoring during detonations shall be employed during pile driving operations, except that pile driving operations may continue until sunset. These measures shall be repeated every day pile driving operations take place.
- Prior to the start of each pile driving operation, the power to the pile driver shall be ramped up to provide warning to marine wildlife of increasing noise levels.

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- Sound pressure level measurements shall be taken when the first pile is driven. The first measurements shall be taken 1000 yards from the pile driving site. Measurements shall be taken just beneath the surface, in mid water and just off the sea floor. Measurements shall be taken just beyond the surf zone east and west of the site and in two directions offshore.
- The measurements shall be assessed immediately to determine if sound pressure levels fall within acceptable limits at the edge of the hazard zone. The hazard zone shall be adjusted if sound levels are higher than anticipated. The regulatory agencies shall be notified immediately of any such changes.
- Considering that sound pressure levels sometimes increase with range in shallow water (please see Appendix 2), additional measurements shall be taken 1500 yards from the pile driving site, at the same depths and bearings indicated previously. These measurements shall also be assessed immediately to make certain that sound pressures fall within acceptable levels at this range.
- Additional measurements shall be made 2000 yards from the project site if the hazard zone is increased. This is to make certain that sound pressures fall within acceptable levels.
- If time allows, measurements shall be made 500 yards from the project site, in the same depth as directions as indicated previously.

4.12 Monitoring Placement of Quarry Rock

- Prior to beginning the placement of quarry rock each day or each time a new load of quarry rock is ready, a land-based monitor shall make certain that no marine mammals are present within 500 feet of the project site.

4.13 Reporting

- A final report shall be prepared by MMCG following project completion. This would include:
 - Executive summary;
 - Description of demolition and pile driving methods;
 - Wildlife observed;
 - Assessment of effectiveness of the mitigation measures;
 - Other relevant information;
 - Conclusions and recommendations; and
 - Literature citations.

5.0 LITERATURE CITED

- Angliss, R.P., D.P. DeMaster and A.L. Lopez. 2001. Alaska Marine Mammal Stock Assessments, 2001. NMFS, Alaska Fisheries Science Center. NOAA Technical Memorandum NMFS-AFSC-124.
- ARCO (Atlantic Richfield Company). 1999. ARCO Environmental Remediation, Lease PRC-421 Removal Procedure.

- _____. 2003. Revised PRC-421 Pier Removal Project: Project Description.
- Bowland, J. 1978. A Study of Six Harbor Seal Hauling Grounds along the Central California Coast. University of California, Santa Barbara, Environmental Studies Department. Senior thesis.
- Bowles, A.E. 1995. Responses of Wildlife to Noise. *In: Wildlife and Recreationists*. Knight, R.L. and K.J. Gutzwiller, editors. Island Press, Washington, D.C. Pp.154-212.
- Carretta, J.V., J. Barlow, K.A. Forney, M. M. Muto, and J. Baker. 2002. U.S. Pacific Marine Mammal Stock Assessments: 2002. NMFS. Southwest Fisheries Science Center. NOAA Technical Memorandum NOAA-TM-NMFS-SWFCS.
- Carretta, J.V., J. Barlow, K.A. Forney, M. M. Muto, and J. Baker. 2001. U.S. Pacific Marine Mammal Stock Assessments: 2001. NMFS. Southwest Fisheries Science Center. NOAA Technical Memorandum NOAA-TM-NMFS-SWFCS-317.
- Cordaro, J. 2003. Personal communications. Marine Mammal Stranding Network Coordinator, Southwest Region, NOAA Fisheries.
- Corwin, J.T. and D.A. Cotanche. 1988. Regeneration of Sensory Hair Cells after Acoustic Trauma. *Science*. 240: 1772-1774.
- De Wit, L.A. 2000. Cited in Padre Associates, Inc. 2002. Draft Environmental Impact Report for the PRC-421 Pier Removal Project. SCH # 20011021119.
- Fahy, C. 1999. National Marine Fisheries Service, Long Beach, California. Personal communication.
- Fugro 1999. Bathymetric and Sea Floor Features Survey, State Lease PRC-421, Santa Barbara County.
- Greene, C. R. 2001a. Letter to R. Rosenbaum of Venoco, Inc., regarding estimates of pile driving sounds at Lease 421. 7 June 2001.
- _____. 2001b. Letter to S. Grieg of Venoco, Inc., regarding estimates of pile driving sounds at Lease 421. 8 June 2001.
- Gunderboom. 2003. Sound Attenuation System. www.gunderboom.com.
- Howorth, P. 1962-2003. Unpublished field notes.
- _____. 1992. Preliminary Proposal for Marine Wildlife Preservation Effort. Prepared for U.S. Navy, Pacific Missile Test Center [now Naval Air Warfare Center], Pt. Mugu, California.
- _____. 1994a. U.S. Navy, Test Plan, Marine Animal Recovery. U.S. Government Prime Contract N00123-93-D-5115, Delivery Order EW14.
- _____. 1994b. U.S. Navy, Alternate Test Plan, Marine Animal Recovery. U.S. Government Prime Contract N00123-93-D-5115, Delivery Order EW14.
- _____. 1994c. U.S. Navy, A Summary of Marine Animal Capture Specialists Activities in Connection With the U.S. Navy's Ship Shock Trials of DDG 53, *John Paul Jones*. U.S. Government Prime Contract N00123-93-D-5115, Delivery Order EW14.
- _____. 1996a. Marine Mammal Mitigation Plan for 4H Platform Removal Project. Report for Chevron in satisfaction of agency requirements.
- _____. 1996b. Summary Report: Wildlife Mitigation, 4H Platform Removal Project. Report for Chevron in satisfaction of agency requirements.
- _____. 1997a. Summary Report: Wildlife Mitigation, Chevron Wellhead Removal. Report for Chevron in satisfaction of agency requirements.
- _____. 1997b. Final Report: Wildlife Monitoring, South Bay Ocean Outfall, Piling Removal Blasting Project. Report for Case Foundation Company in satisfaction of agency requirements.
- _____. 1997c. Minerals Management Service, Wildlife Protection: Marine Mammals, Sea Turtles and Sea Birds. Verbal paper presented at an MMS

- workshop, Decommissioning and Removal of Oil and Gas Facilities Offshore California: Recent Experiences and Future Deepwater Challenges. Ventura, California.
- _____. 1998a. Acoustic Monitoring Plan for Mobil Seaciff Pier Decommissioning Project Northwest of Ventura, California. Plan to satisfy California Coastal Commission requirements. Prepared for Mobil.
- _____. 1998b. Wildlife Protection Plan for Mobil Seaciff Pier Decommissioning Project Northwest of Ventura, California. Plan in satisfaction of agency requirements. Prepared for Mobil.
- _____. 1998c. Final Report, Part One: Acoustic Monitoring for Mobil Seaciff Pier Complex Decommissioning Project Northwest of Ventura, California. Report for Mobil in satisfaction of agency requirements.
- _____. 1998d. Final report, Part Two: Technical Report: Underwater Acoustic Source Level Measurements, Explosive Caisson Demolitions, Mobil Seaciff Pier Complex Northwest of Ventura, California. [Edited by Howorth.]
- _____. 1998e. Final Report: Wildlife Protection During the Decommissioning of the Mobil Seaciff Pier Complex Northwest of Ventura, California. Report for Mobil in satisfaction of agency requirements.
- _____. 1998f. Final Report: Wildlife Monitoring, Geophysical Tests of Well HA-26, Exxon Platform Harmony, Gaviota, California. Report for Exxon in satisfaction of agency requirements.
- _____. 2000. Marine Life Mitigation Plan for San Francisco-Oakland Bay Bridge Seismic Retrofit, East Span Project. Section of Environmental Impact Report dealing with protection of marine mammals, sea turtles, sea birds, land birds, fish, and invertebrates from effects of explosive demolition activities.
- _____. 2001. Marine Mammal Monitoring Interim Report: Remedial Gas Pipeline Support Repairs with Pile Driving at Carpinteria, California. Prepared in satisfaction of agency requirements.
- Leatherwood, S., R. Reeves, W. Perrin, and W. Evans. 1983. Whales, Dolphins and Porpoises of the Eastern North Pacific and Adjacent Arctic Waters. NOAA Technical Report, National Marine Fisheries Service Circular 444. 246 pages.
- Leatherwood, S., B. Stewart and P. Folkens. 1987. Cetaceans of the Channel Islands National Marine Sanctuary. Published by Channel Islands National Marine Sanctuary, NOAA, and the National Marine Fisheries Service. 68 pages.
- Leidel, D. 1999. Explosive Effects Analysis. *In*: ARCO Environmental Remediation LLC PRC-421.
- Lorentz, J. 2003. Personal communications. Fairweather Pacific, LLC, Ventura, California.
- MMS (Minerals Management Service). 2001. Draft Environmental Impact Statement. Delineation Drilling Activities in Federal Waters Offshore Santa Barbara County, California. MMS, Pacific Outer Continental Shelf region, Camarillo, California
- NMFS (National Marine Fisheries Service) and USFWS (U.S. Fish and Wildlife Service).
- _____. 1998a. Recovery Plan for U.S. Pacific Populations of the East Pacific Green Turtle (*Chelonia mydas*). National Marine Fisheries Service, Silver Spring, Maryland.
- _____. 1998b. Recovery Plan for U.S. Pacific Populations of the Olive Ridley Turtle (*Lepidochelys olivacea*). National Marine Fisheries Service, Silver Spring, Maryland.
- _____. 1998c. Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle (*Caretta caretta*). National Marine Fisheries Service, Silver Spring, Maryland.

- _____. 1998d. Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (*Dermochelys coriacea*). National Marine Fisheries Service, Silver Spring, Maryland.
- Padre Associates, Inc. 2002. Draft Environmental Impact Report for the PRC-421 Pier Removal Project. SCH # 20011021119.
- Rambo, M. 1978. A Study of Three Harbor Seal (*Phoca vitulina richardsi*) Hauling Grounds along the Santa Barbara County Coast. University of California, Santa Barbara, Environmental Studies Department. Senior thesis.
- Richardson, W., C. Greene, C. Malme, and D. Thomson. 1995. Marine Mammals and Noise. Academic Press. San Diego. 676 pages.
- Rugh, D.J., M.M. Muto, S.E. Moore, and D.P. DeMaster. 2002. Status Review of the Eastern North Pacific Stock of Gray Whales. NOAA, National Marine Fisheries Service, National Marine Mammal Laboratory, Seattle, Washington.
- Ryals, B.M. and E.W. Rubel. 1988. Hair Cell Regeneration after Acoustic Trauma in Adult *Coturnix* Quail. Science. 240(4860): 1774-1776.
- Sadler, M. 1976. Harbor Seal Hauling Grounds on the Mainland South Coast of Santa Barbara County: A Case Study at "Seals," California. University of California, Santa Barbara, Environmental Studies Department. Senior thesis.
- Sanders, G. 1999-2003. Personal communications.
- Santa Barbara Marine Mammal Center. 1976-1998. Unpublished records.
- Schusterman, R.J. 1981. Behavioral Capabilities of Seals and Sea Lions: A Review of Their Hearing, Visual, Learning, and Diving Skills. Psychology Record. 31(2): 125-141.
- Stewart, B. 1999. Northern Elephant Seals: Southern California Beachmasters. In Alolkoy, the Publication of Channel Islands National Marine Sanctuary. Fall 1999. Volume 12, number 2. P. 8.
- Terhune, J.M. 1988. Detection Thresholds of a Harbor Seal to Repeated Underwater High-frequency, Short-Duration Sinusoidal Pulses. Canadian Journal of Zoology. 66(7): 1578-1572.
- USFWS (United States Fish and Wildlife Service). 1997. Recovery Plan for the Western Snowy Plover. Pacific Coast Population Draft Recovery Plan. 14 August 2001.
- USGS (United States Geological Survey). 2003. California Sea Otter Numbers Are Up for the 2003 Census. 6 June 2003. <http://www.werc.usgs.gov/news/2003-06-06.html>.
- Winsor, N. and P. Howorth. 2000. Explosives modeling for San Francisco-Oakland Bay Bridge Seismic Retrofit, East Span Project. Technical report for establishing wildlife safety zones during explosive demolition activities.
- Wursig, B., C.R. Greene, Jr., and T.A. Jefferson. 2000. Development of an Air Bubble Curtain to Reduce Underwater Noise of Percussive Piling. Marine Environmental Research: 49 (2000) 79-93.
- Yelverton, J. T., D. R. Richmond, E. R. Fletcher and R. K. Jones. 1973. Safe Distances from Underwater Explosions for Mammals and Birds. DNA 3114T Defense Nuclear Agency.

6.0 APPENDIX 1:

TABLES 3-7

SEASONALITY AND OCCURRENCE OF MARINE WILDLIFE NEAR PROJECT SITE

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Table 3: Seasonality and Likelihood of Occurrence of Odontocetes (Toothed Whales) near Project Site

Genus and species	Status	Seasonality/ Likelihood of Occurrence
Long-beaked common dolphin (<i>Delphinus capensis</i>)	Protected under MMPA.	Year-round. Possible.
Short-beaked common dolphin (<i>Delphinus delphis</i>)	Protected under MMPA.	Year-round. Unlikely.
Risso's dolphin (<i>Grampus griseus</i>)	Protected under MMPA.	Year-round; most abundant in winter. Unlikely.
Short-finned pilot whale (<i>Globicephala macrorhynchus</i>)	Protected under MMPA.	Year-round. Extremely remote.
Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>)	Protected under MMPA.	Usually colder water months. Unlikely.
Northern right whale dolphin (<i>Lissodelphis borealis</i>)	Protected under MMPA.	Winter and spring. Unlikely.
Killer whale (<i>Orcinus orca</i>)	Protected under MMPA.	Year-round. Unlikely.
False killer whale (<i>Pseudorca crassidens</i>)	Protected under MMPA.	Warm water months. Extremely unlikely..
Spotted dolphin (<i>Stenella attenuata</i>)	Protected under MMPA.	Unknown. Extremely remote.
Striped dolphin (<i>Stenella coeruleoalba</i>)	Protected under MMPA.	Unknown. Extremely remote.
Long-snouted spinner dolphin (<i>Stenella longirostris</i>)	Protected under MMPA.	Unknown. Extremely remote.
Rough-toothed dolphin (<i>Steno bredanensis</i>)	Protected under MMPA.	Unknown. Extremely remote.
Bottlenose dolphin - offshore stock (<i>Tursiops truncatus</i>)	Protected under MMPA.	Year-round. Extremely remote.
Bottlenose dolphin - coastal stock (<i>Tursiops truncatus</i>)	Protected under MMPA.	Year-round. Likely.
Hubb's beaked whale (<i>Mesoplodon carlhubbsi</i>)	Protected under MMPA.	Unknown. Extremely remote.
Blainville's beaked whale (<i>Mesoplodon densirostris</i>)	Protected under MMPA.	Unknown. Extremely remote.
Ginkgo-toothed whale (<i>Mesoplodon ginkgodens</i>)	Protected under MMPA.	Unknown. Extremely remote.
Perrin's beaked whale* (<i>Mesoplodon perrini</i>)	Protected under MMPA.	Unknown. Extremely remote.
Stejneger's beaked whale (<i>Mesoplodon stejnegeri</i>)	Protected under MMPA.	Unknown. Extremely remote.
Baird's beaked whale (<i>Berardius bairdii</i>)	Protected under MMPA..	Late spring to early fall. Extremely remote.
Cuvier's beaked whale (<i>Ziphius cavirostris</i>)	Protected under MMPA.	November through April. Extremely remote.
Sperm whale (<i>Physeter macrocephalus</i>)	Protected, strategic and depleted under MMPA. Endangered under ESA.	Year-round. Extremely remote.

Table 3: Seasonality and Likelihood of Occurrence of Odontocetes (Toothed Whales) near Project Site (continued)

Genus and species	Status	Seasonality/ Likelihood of Occurrence
Pygmy sperm whale (<i>Kogia breviceps</i>)	Protected under MMPA.	Unknown. Extremely remote.
Dwarf sperm whale (<i>Kogia simus</i>)	Protected under MMPA.	Unknown. Extremely remote.
Dall's porpoise (<i>Phocoenoides dalli</i>)	Protected under MMPA.	Winter and spring. Unlikely.
Harbor porpoise (<i>Phocoena phocoena</i>)	Protected under MMPA.	Fall and winter. Extremely remote.

*Perrin's beaked whale, a newly named species, was erroneously identified as Hector's beaked whale in earlier accounts.

Table 4: Seasonality and Likelihood of Occurrence of Mysticetes (Baleen Whales) near Project Site

Genus and species	Status	Seasonality/ Likelihood of Occurrence
Blue whale (<i>Balaenoptera musculus</i>)	Protected, strategic and depleted under MMPA. Endangered under ESA.	June to September. Very unlikely.
Fin whale (<i>Balaenoptera physalus</i>)	Protected, strategic and depleted under MMPA. Endangered under ESA.	Summer and fall. Very unlikely.
Sei whale (<i>Balaenoptera borealis</i>)	Protected, strategic and depleted under MMPA. Endangered under ESA.	Spring and summer. Extremely remote.
Minke whale (<i>Balaenoptera acutorostrata</i>)	Protected under MMPA.	Year-round; most abundant in spring and summer. Unlikely.
Bryde's whale (<i>Balaenoptera edeni</i>)	Protected under MMPA.	Unknown. Extremely remote.
Humpback whale (<i>Megaptera novaeangliae</i>)	Protected, strategic and depleted under MMPA. Endangered under ESA.	May – September. Very unlikely.
Northern right whale (<i>Eubalaena glacialis</i>)	Protected, strategic and depleted under MMPA. Endangered under ESA.	Unknown. Extremely remote.
California gray whale (<i>Eschrichtius robustus</i>)	Protected under MMPA.	December through May; rare rest of year. Very unlikely.